Thesis/
Report

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NEOTROPICAL MIGRANT BIRD NESTING USE OF COTTONWOOD FRAGMENTATION THE SOUTH FORK, SNAKE RIVER

FINAL REPORT FOR RESEARCH AGREEMENT
#INT-92653-RJVA
"Neotropical Migrant Bird Nesting Use of Cottonwood Fragmentson the South Fork, Snake River"
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BREEDING PRODUCTIVITY OF NEOTROPICAL MIGRANT LANDBIRDS IN COTTONWOOD FORESTS ALONG THE SOUTH FORK OF THE SNAKE RIVER, IDAHO

SUMMARY OF 1994 FIELD SEASON
(1995 Progress Report)

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PROJECT SUMMARY

Western riparian habitats support over 60% of the breeding neotropical migrant birds in the western United States, yet these habitats are among the most rapidly declining and heavily utilized areas in the west. To maintain healthy populations of songbirds we must understand their life histories and population dynamics, which means it is crucial to identify the habitat characteristics associated with successful nesting. From 1992 through 1994 we found and monitored 2167 passerine nests. Initial results suggest few differences in vegetation characteristics for successful versus depredated nests. Nest densities are greatest in small patches versus large. Cattle grazing may influence species distributions and nest densities more than nesting success. Finally, area-sensitive species do not adhere entirely to expected predictions of lower nest density and higher predation rates in small patches. These data provide both crucial management information and novel life history and habitat selection data for western riparian birds. Furthermore, these data begin to uncover mechanistic explanations for changes in songbird population dynamics instigated by changing land use practices.

INTRODUCTION

Western riparian habitats contain and support relatively dense populations of neotropical migrant birds (Ohmart & Anderson 1982, Rice et al. 1983, Strong and Bock 1990), including 60% of the neotropical migratory birds occurring in Idaho (Saab & Groves 1992). The Nature Conservancy (1987) considers riparian cottonwood forests (Populus spp.) to be among the rarest of forest types in North America. Yet these riparian forests are under intense pressures of habitat fragmentation from agricultural encroachment and cattle grazing.

On the breeding grounds, neotropical migrant population declines are attributed to habitat loss and fragmentation (Whitcomb et al. 1981, Askins et al. 1990, Hagan & Johnston 1992). Habitat fragments contain fewer species and those species have increased nest parasitism and predation rates relative to larger, contiguous forest tracts (Whitcomb et al. 1981, Ambuel & Temple 1983, Wilcove 1985, Robbins et al. 1989b, Sandstrom 1991). Fragmentation research has largely been conducted in eastern, historically unfragmented, forests. In contrast, western riparian forests are linear and naturally fragmented, suggesting western riparian birds may be relatively adapted to fragmented conditions. Thus, results from eastern studies are potentially inapplicable to western riparian systems. Furthermore, a better understanding of bird responses to fragmentation in historically fragmented systems could provide insight for maintaining stable populations of declining eastern birds.

Western riparian habitats are also subject to extensive grazing. High grazing pressure decreases habitat quality for both migratory and non-migratory birds (Sedgwick & Knopf 1987, Knopf et al. 1988). In particular, understory habitat is lost and may result in increased nest predation and parasitism rates (Martin 1992). Such negative demographic consequences are detrimental to population maintenance. Given the importance of riparian habitats, studies are urgently needed to examine the effects of grazing on the presence and breeding productivity of neotropical migrants in western riparian habitats.

In 1991, Victoria Saab, with the Forest Service Intermountain Research Station, initiated work on the South Fork of the Snake River in southeastern Idaho (Study Plan No. 4202-1-7-1). Her objectives were to determine minimum area requirements for riparian-associated, neotropical migrant birds relative to disturbance applications (grazing and recreation) and surrounding land use practices. This study compliments her continuing census work by monitoring breeding productivity of neotropical migrant and other nongame birds to determine whether these high density populations are nesting successfully.

This study has 4 objectives:

(1) Determine habitat features necessary for successful nesting of neotropical migrant birds in cottonwood riparian forests.
(2) Determine whether nest predation and parasitism rates increase with decreases in cottonwood patch area.
(3) Determine whether nest predation and parasitism rates increase in grazed patches.
(4) Determine whether species absent from smaller fragments are more susceptible to predation and parasitism pressures.

STUDY AREA

The study area lies within the cottonwood gallery forest along the South Fork of the Snake River from Palisades Dam to the Henry's Fork confluence (ca. 100 km) in southeastern Idaho. The plots are in Jefferson, Bonneville, and Madison Counties, approximately 25 miles NNE of Idaho Falls, ID. This area consists of a mountain valley along the upstream section, a rugged canyon in the middle section, and a wide river with a broad floodplain along the downstream end. The riparian forest is dominated by narrowleaf cottonwood (*Populus angustifolia*). Dogwood (*Cornus stolonifera*) is the dominant shrub with birch (*Betula occidentalis*), alder (*Alnus incana*), and willows (*Salix* spp.) completing the major shrub component.

METHODS

Study Sites

A subset of sites was chosen from the census work sites (Study Plan No. 4202-1-7-1). Sites were chosen to represent variability in treatment (undisturbed vs grazed), location (upstream vs downstream), and size (small and large; Figure 1). Grazed sites were selected for similar grazing pressures so that grazing could be treated as a discrete treatment effect rather than a continuous variable of differing grazing pressures. Plots without campsites or grazing pressure were defined as undisturbed sites. Location was given a binary classification based on topography. Sites occurring within or adjacent to canyon or foothill habitat were classified as "upstream" (Figure 1). Sites further downstream without surrounding cliff walls were listed as "downstream." Size classes were based on V. Saab's initial (1991) census data defining large sites as greater than the 7-ha species-area asymptote (bird species plotted as a function of site area). Size will be treated as a continuous variable to determine if there are any effects not identified from the binary categorization. All sites were gridded at 25 m intervals with temporary wooden stakes to determine boundaries of nest searching area and to define the plot. The entire site was the nest searching plot for all sites, except two of the large sites (Braided and Blakely). However the grids still encompassed the entire census transect (5 point count stations at 200 m apart) out to a 100 m buffer.

Avian Sampling

Nests were located and monitored every 2-4 days until fate was determined (Martin & Guepel 1993) for all species on the plots. A nest was successful if at least one genetic young fledged. A nest was considered unsuccessful if eggs disappeared, nestlings were gone before fledging was possible, depredation evidence was present (e.g., shell fragments, hole in nest, or nest torn up), or if only Brown-headed Cowbird young fledged. Contents of accessible nests were monitored for brown-headed cowbird (*Molothrus ater*) parasitism. Estimates of cowbird parasitism are conservative because high nests were unable to be checked.

Avian Analysis

All nest data have been entered and analyses are ongoing. Daily survival rates and nest success (%) were calculated using Mayfield's method (Mayfield 1961, 1975, Hensler and Nichols 1981). Total daily survival was compared by treatment, location, and size within each species using the chi-square comparison program CONTRAST (unpub. program, Hines and Sauer 1989; as

discussed by Sauer and Williams 1989). Regression analyses will be used to control for size when determining whether there is a treatment or location effect. Minimum criteria for analysis was $\geq$ 15 nests for each year when data were considered separately. All three years were combined and the minimum sample size for analysis was $\geq$ 20 nests.

Species abbreviations and scientific names are listed in Appendix A.

Vegetation Sampling

Vegetation sampling has two goals: 1) quantify vegetation requirements for successful nesting habitat; and 2) document available nest vegetation among sites.

Vegetation was sampled at each nest and a random, nonuse site to quantify nesting habitat. Sampling was centered on the nest and 35 m away on a plant as similar to the nest substrate as possible. Nonuse sites were located along a similar topographical contour. Thirty-five meters was chosen as it reflects a separate but potential nesting site within a territory.

A stratified random sample characterized available nest vegetation. The sites have two distinct vegetation "zones," both of which are important to nesting birds. The inner portion is characteristic cottonwood habitat, while the outer, shoreline habitat contains dogwood, birch, willow, or alder shrubs, often without cottonwood (scientific names are listed in Appendix B). The cottonwood zone was sampled using BBIRD protocol (Tom Martin, unpublished protocol). Additional sampling was conducted every 100 m along the length of the plot and then every 50 m out the width of the plot until the shoreline edge was reached.

All vegetation plots (nest, nonuse, and availability) were sampled at two spatial scales. Shrubs, saplings, and poles were counted at 10 cm above ground by species and stem-diameter classes ($<$2.5 cm, 2.5-5 cm, and 5-8 cm) within a 5 m-radius circle. If shrub stems divided as they came out of the ground below 10 cm, each stem was counted. If the stems divided above 10 cm they were counted as one stem. Canopy cover was estimated using densiometer readings taken at each of the four cardinal directions while standing in the center of the sampling plot. Litter depth was measured using a long, sharp rod inserted through the litter until striking mineral soil. Ten readings were taken at 2 m intervals in two transects; one running parallel to the plot contour and another that runs perpendicular to the contour, bisecting the 5 m-radius plot. In 1992, ground cover was estimated using ocular tubes (James and Shugart (1971) at the same points as litter depth. In 1993, ground cover estimates were simplified by estimating percent coverage of bare ground, grass, forb, litter, downed log, and water within the 5 m

radius plot. Canopy height was measured with a clinometer by measuring height of the average tallest trees in each plot. Trees were counted by species and stem-diameter classes (8-23 cm, 23-38 cm, >38 cm) within a 11.3 m-radius circle.

Vegetation Analysis

All 5 m-radius and 11.3 m-radius samples for nest and nonuse vegetation has been entered and data analysis is ongoing. Univariate comparisons of nest placement variables between treatments and between successful versus depredated within each treatment will be made with Student's t-test (Murphy 1983) and ANOVA tests (Martin & Roper 1988, Bergin 1992). Significance will be at $P < 0.05$. Homogeneity of variances will be tested using F_{max}-test (Sokal & Rohlf 1981). If variances are heteroscedastic, an approximate t-test (based on assumption of unequal variances) and an ANOVA will be used to test for significant differences between means (Sokal & Rohlf 1981). Log transformations will be used when variances are unequal and arcsine transformation with proportional variables. *A posteriori* stepwise discriminant function analysis will be used to determine which habitat characteristics discriminate between groups of nesting versus nonuse, and successful versus depredated nests for species with $\geq$ 15 nests for all comparison levels (e.g., location, location x treatment, year, etc.)

Plant species, abbreviations, and scientific names are listed in Appendix 2.

RESULTS AND DISCUSSION

A total of 664 active nests was found and monitored in 1992. In 1993 901 nests and in 1994 602 nests were found and monitored, ending with a grand total of 2,167 nests monitored over three years (Table 1). Yellow Warblers and American Robins were the most numerous nests found. Less common species include Song Sparrow, Fox Sparrow, Cedar Waxwing, Veery, Northern Oriole, Western Wood-Pewee, Black-headed Grosbeak, Gray Catbird, Yellow-breasted Chat, Yellow-rumped Warbler, and Yellow-billed Cuckoo. At least 10 nests were found for 26 species and at least one nest was found for another 21 species for a total of 47 species represented (Table 1).

OBJECTIVE I: Habitat features necessary for successful nesting

Data for all three years will be analyzed separately and combined to determine the habitat features associated with successful nesting. Nest-site selection will be evaluated on several levels: 1) nest sites will be compared to vegetation availability data to determine what macrohabitat features individuals use; 2) nest and nonuse plot comparisons will determine the vegetation parameters an individual is choosing within a territory; 3) successful versus unsuccessful nests will allude to which habitat features may facilitate nesting success; and 4) vegetation features associated with successful nesting will be compared to vegetation availability data to better understand how vegetation constrains nest placement and reproductive success.

For many species these data are the first to provide insight for habitat characteristics associated with successful nesting. Individuals nesting in areas with habitat characteristics that are most similar to those habitat characteristics associated with a species presence (e.g., James 1971 or Whitmore 1977) may be more successful. For example, if Song Sparrows were associated with little canopy cover, high shrub density, and moderate ground cover, then we predict that those nests that have less canopy cover, higher shrub density, and moderate ground cover would be most successful. This logic is used for a few of the following species when there were no clues as to which possible habitat characteristics might be important to success of the nest. It is recognized, however, that this logic covers two different scales of habitat selection; territorial versus nest placement.

Preliminary analyses of univariate comparisons for successful versus depredated nests for all three years are ongoing. For 1993, few vegetation characteristics measured were significantly different between successful and depredated nests. This could be due to homogeneity of vegetation, high predation rates resulting in too few nests for differences to be unmasked, or the vegetation was measured incompletely. Species accounts follow for a few of the most common species on undisturbed sites in 1993.

> Yellow Warblers depend on the presence of understory vegetation for nesting (Ficken & Ficken 1966, Morse 1966, Knopf & Sedgwick 1992). Dogwood, the dominant shrub, as well as other shrub densities were not significantly different between successful and depredated nests, except for a higher density of snowberry in the nest patch of successful nests. There was a significantly higher overhead cover for successful nests (75%) compared to depredated nests (63%), but no differences in sidecover. Successful nests were significantly higher off the ground than depredated nests, which is interesting

because it has also been found that unparasitized Yellow Warbler nests were higher than parasitized nests (DellaSalla 1985). Parasitism rates have not been analyzed.

American Robins are generally found in areas of limited understory (James 1971). We found no significant differences in understory densities of dogwood between successful and depredated nests. However, snowberry was much more dense in successful nest patches. Other variables that were significantly different were a higher green ground cover and grass/sedge ground cover in those nest patches of depredated nests. Medium-sized cottonwood trees were significantly more dense around successful nests, potentially a result of birds choosing sites with more alternate nest sites, which could decrease predation pressure (Martin 1992).

Song Sparrows with successful nests had significantly less canopy cover, leaf litter ground cover, and brushy ground cover. The presence of water is important for territorial establishment of this species (Greenberg 1988, 1992). Analysis of water variables is ongoing.

Mourning Doves are midstory branch nesters that did not have any significantly different vegetation characteristics between successful and depredated nests.

Cedar Waxwings are shrub to midstory nesters. Nest height was an important characteristic, with higher nests more successful than lower nests.

Warbling Vireos require the presence of high trees (James 1971), high canopy cover, and shrub density with low ground cover. We found none of these characteristics to differ significantly between successful and depredated nests. This suggests that the scale at which these vireos select their territories may differ from that which is important for nest placement to affect predation rates.

Northern Orioles make pendulous nests from medium-large trees and did not have any vegetation characteristics that differed between successful versus depredated nests.

Black-headed Grosbeaks are shrub nesters and the successful nests had significantly lower percent green ground cover and grass/sedge ground cover than depredated nests. However, no shrub densities differed. There was an increased density of medium-sized cottonwood trees in the nest patch of successful nests.

Veerys are ground to near-ground nesters and successful nests were significantly lower than failed nests. They also had a significantly greater litter depth in the nest patch than failed nests. Litter depth could be an important proximate cue of food abundance. If greater litter depth leads to high food abundance, then less time off the nest may be spent for foraging bouts, which may reduce predation rates. Dogwood densities were also significantly decreased around successful nests.

OBJECTIVE II: Determine whether nest predation and parasitism rates increase with decreases in cottonwood patch area

Fragmentation theory suggests smaller habitat patches will have lower species densities and reduced success as a result of increased predation and parasitism rates. However, species occurring in traditionally fragmented habitats may not exhibit these trends. Ten of the 12 most common species exhibited an almost 2-fold to 4-fold increase in nest densities in small plots (Table 2). Cedar Waxwings were the only species to have significantly higher nest densities in small sites, but only for 1993 (Table 2). Interestingly, none of the birds monitored had higher nest densities in large plots except for the Western Wood-Peewee in 1992 (Table 2). A nonparametric sign test of the probability that a species' nest density will be greater in either large or small plots found small plots to have significantly greater densities for the 12 most common species in all years [$P(+) = P(-) = 0.5$: 1992, $P < 0.0029$; 1993, $P < 0.0002$; 1994, $P < 0.0054$].

Daily survival of nests presents a different picture (Tables 4-9). For all three years combined Yellow Warbler, Veery, and Northern Flicker nests show statistically significantly higher survival rates in large plots (Table 7), which is consistent with traditional fragmentation theory but opposite our nest density pattern for Yellow Warblers and Veerys. Vegetation parameters, predator communities, and brown-headed cowbird parasitism rates are possible explanations for these differences and will be further explored. The Veery has been classified as a potentially area-sensitive species (Robbins *et al.* 1989a). Smaller habitat patches presumably are more accessible to predators and Brown-headed Cowbirds, resulting in lower quality habitats. In conjunction, the Veery may be unable to adjust nest site selection characteristics in small patches and subsequently be subject to increased predation or parasitism rates.

If plot size is examined within each treatment then both the Northern Flicker and Veery exhibit greater success in large plots that are undisturbed (Table 8). There is no detectable difference in survival rates on grazed plots that differ in size because the nest density of these two species

is low for grazed plots (Table 9). In contrast, the difference in Yellow Warbler survival rates between large and small plots are found on grazed plots (Table 9) rather than undisturbed (Table 8). Therefore, an interaction between treatment and size is occurring, and further analyses will explore this pattern.

OBJECTIVE III: Determine whether nest predation and parasitism increase in grazed patches

Habitat quality for open-ground foraging and aerially insectivorous birds should increase in grazed areas (summarized in Bock *et al.* 1993). Conversely, as grazing pressure opens up the understory, shrub-nesting birds and species that utilize/prefer dense understory vegetation should decrease in abundance and potentially experience increased predation and parasitism pressure (Martin 1992). These predictions are generally consistent with what we have seen during the 1992 and 1993 field seasons.

Species expected to increase in abundance as moderate grazing pressure opens up the understory include the Western Wood-Peewee, House Wren, American Robin, and Northern Flicker. Even though not significant, the Western Wood Peewee, House Wren and Northern Flicker for both years exhibited at least a 2-fold increase in grazed sites (Table 3). Snag densities did not increase in grazed sites (preliminary analysis of vegetation data), which suggests these higher densities are a result of foraging preferences for the House Wren rather than available nest substrates. American Robins, a ground foraging species, exhibited higher nest densities in grazed sites in 1993 (Table 3), which is consistent with the idea that moderate grazing reduces ground cover providing increased open-ground foraging substrate.

Species expected to decrease in abundance on grazed sites include Yellow Warblers, Song Sparrows, Black-headed Grosbeaks, and Veerys because all of these birds nest in shrubs. The Veery and Song Sparrow also seem to prefer to forage in and under dense understory (pers. obs). Yellow Warblers and Black-headed Grosbeaks had significantly less nests in grazed sites in 1993 and the trend had been demonstrated for 1992 as well (Table 3). Song Sparrows and Veerys demonstrated the trend in both years but without significance. Cedar Waxwings, Mourning Doves and Northern Orioles both showed a higher density in grazed for one year and a lower density in grazed sites the other year, with Cedar Waxwings lower density in grazed being significant in 1992 (Table 3). Finally, Warbling Vireos actually had higher nest densities in grazed sites both years but the differences were not significant.

Trends in nesting success of open-ground foragers and aerially insectivorous birds did not follow predictions for nest densities (Tables 10-14). In fact, there is no consistent pattern among survival rates and nest densities for either between years or for years combined. Although not significant, the House Wren did have greater success in grazed plots, but the Western Wood-Peewee had greater success in undisturbed plots. While the Yellow Warbler, Warbling Vireo, and Veery had greater success on grazed sites (Table 12), which is opposite abundance trends except for the Warbling Vireo. However, the fact that Veerys have greater success on grazed could be a function of a small sample of nests on grazed sites. The American Robin had approximately the same nesting success, regardless of whether the site was grazed or not.

Categorizing sites as only grazed and undisturbed may be too simplistic. When the grazed versus undisturbed comparison was further partitioned into upstream or downstream (Table 13 & 14), the greater success on grazed plots by Yellow Warblers, Warbling Vireos, and Veerys occur only on upstream plots (Table 13). The partitioning also demonstrated that Cedar Waxwings had significantly less success in upstream, grazed plots (Table 13), which might be expected since it is a shrub nester.

There is census evidence of avian predators being absent on some of the downstream plots. Other predators may also vary in presence among plots (e.g., snakes, chipmunks, etc). Nest survival rates differ significantly between locations (upstream versus downstream) for Yellow Warblers, American Robins, Black-headed Grosbeaks, and Cedar Waxwings at least one of the three study years regardless of whether it is a grazed or undisturbed plot (Tables 16-21). Therefore, location or type of predator and size of the site potentially interact with grazing regime. To determine whether a species has a higher nesting success on an undisturbed versus a grazed plot requires further analyses of interactions and is ongoing.

OBJECTIVE IV: Determine whether species absent from smaller fragments are more susceptible to predation and parasitism pressures

A possible mechanistic explanation for area-sensitivity is that high predation and parasitism pressures differentially select against some birds. The Veery is potentially an area-sensitive species (Robbins *et al.* 1989a); it tends not to exist in small fragments in the eastern U.S. In contrast, Veery's in this system have higher nest densities in small fragments (Table 2). However, Veerys still have significantly higher predation rates in small fragments (Tables 7 & 8). There are three possible explanations for this seemingly contradictory pattern: 1) this population is large and extending into lower quality habitat, 2) that small fragments in this

system have floristic structure and composition that provide the necessary cues for nest placement, and/or 3) these high predation pressures are relatively recent in this system. Vegetation constraints will be examined by comparing available nest vegetation and habitat features associated with successful nesting among patches. Documentation of predator communities among sites is available for analysis but presently we have no historical record. Parasitism rates are conservative in this system and are still being analyzed.

The Western Wood-Peewee was the only species exhibiting reduced nest density in small fragments, but this was only for one year (Table 2). The prediction of greater success in large fragments held true but was not statistically significant (Tables 5-9). A review of the literature and further analysis will provide insight to whether this species is exhibiting area-sensitivity.

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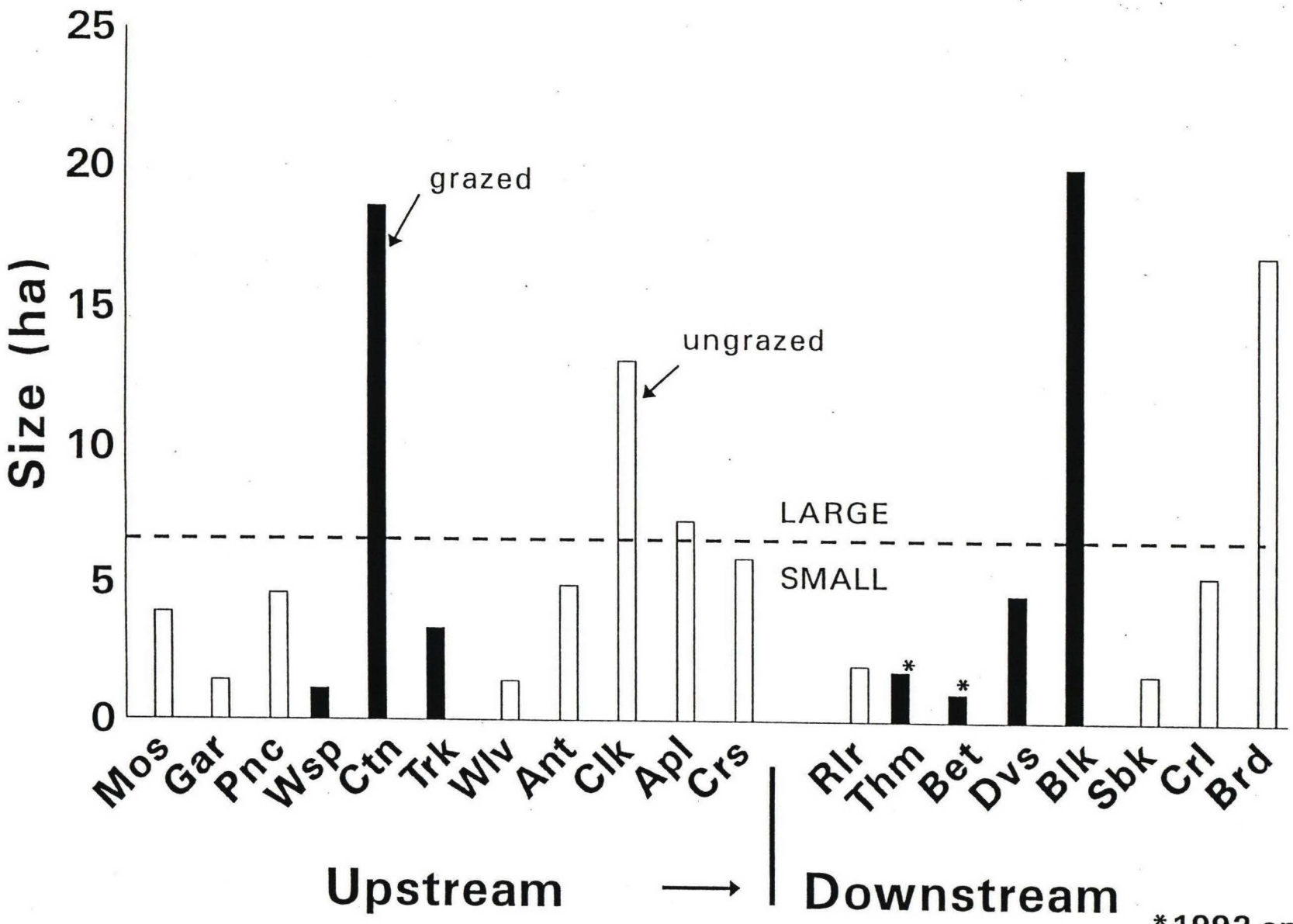

Figure 1. Design of study sites for nongame bird breeding productivity study along the South Fork of the Snake River, Idaho, in 1992-1994.

Table 1. Three-year total (1992-1994) of nests found and monitored in riparian, cottonwood forests (grazed and undisturbed) along the South Fork of the Snake River in Idaho.

Yellow Warbler	779	American Robin	489
Song Sparrow	146	Mourning Dove	101
House Wren	81	Cedar Waxwing	57
Warbling Vireo	52	Northern Oriole	48
Black-headed Grosbeak	39	Western Wood-Peewee	33
Veery	28	European Starling	27
Black-billed Magpie	25	Red-naped Sapsucker	23
American Goldfinch	22	Northern Flicker	21
American Crow	19	Yellow-rumped Warbler	17
Black-capped Chickadee	16	Dusky Flycatcher	15
Gray Catbird	15	Tree&Violet-green Swallows	14
Teal & Mallard	13	Chipping Sparrow	12
Lazuli Bunting	12	Fox Sparrow	12
Yellow-breasted Chat	7	Downy Woodpecker	7
Cassin's Finch	6	Spotted Sandpiper	5
Hummingbird spp.	5	American Kestrel	3
Red-winged Blackbird	2	MacGillivray's Warbler	2
Ruffed Grouse	2	Western Tanager	2
Yellow-billed Cuckoo	2	Cooper's Hawk	1
Sharp-shinned Hawk	1	Solitary Vireo	1
Mountain Chickadee	1	Red-breasted Nuthatch	1
White-breasted Nuthatch	1	Long-eared Owl	1
Hairy Woodpecker	1	**GRAND TOTAL**	**2167**

Table 2. Mean nest density (SE) of species on large versus small sites in 1992, 1993, and 1994 on the South Fork of the Snake River, Idaho. Mean nest density is the overall mean of average nest density for each site. Sample size is the number of sites for the overall mean nest density. In 1992, n = 5 large and 9 small sites; in 1993, n = 5 large and 11 small sites; in 1994, n = 3 large and 9 small sites.

SPECIES		LARGE	SMALL
Yellow Warbler	1992	2.07 (0.74)	4.58 (1.24)
	1993	2.59 (1.08)	3.86 (0.95)
	1994	3.23 (0.93)	4.78 (0.96)
American Robin	1992	1.42 (0.73)	2.09 (0.76)
	1993	1.58 (0.51)	3.51 (0.74)
	1994	1.26 (0.59)	1.72 (0.40)
Song Sparrow	1992	0.23 (0.09)	1.13 (0.77)
	1993	0.14 (0.07)	1.84 (0.18)
	1994	0.60 (0.38)	2.21 (0.83)
Mourning Dove	1992	0.26 (0.12)	0.43 (0.18)
	1993	0.25 (0.11)	0.38 (0.25)
	1994	0.42 (0.35)	0.43 (0.23)
House Wren	1992	0.16 (0.07)	0.67 (0.33)
	1993	0.22 (0.12)	0.46 (0.19)
	1994	0.15 (0.09)	0.23 (0.17)
Cedar Waxwing	1992	0.27 (0.11)	0.38 (0.21)
	1993*	0.04 (0.02)	0.27 (0.10)
	1994	0.17 (0.10)	0.64 (0.25)
Northern Oriole	1992	0.15 (0.13)	0.28 (0.12)
	1993	0.15 (0.11)	0.30 (0.15)
	1994	0.17 (0.09)	0.43 (0.31)
Warbling Vireo	1992	0.10 (0.03)	0.21 (0.11)
	1993	0.04 (0.02)	0.64 (0.33)
	1994	0.11 (0.02)	0.51 (0.23)

Black-headed Grosbeak	1992	0.09 (0.05)	0.23 (0.16)
	1993	0.12 (0.06)	0.37 (0.15)
	1994	0.05 (0.05)	0.27 (0.09)
Veery	1992	0.07 (0.03)	0.23 (0.16)
	1993	0.06 (0.03)	0.19 (0.13)
	1994	0.02 (0.02)	0.28 (0.16)
Western Wood Peewee	1992	0.06 (0.03)	0.02 (0.02)
	1993	0.13 (0.07)	0.15 (0.08)
	1994	0.11 (0.02)	0.32 (0.24)
Northern Flicker	1992	0.04 (0.03)	0.12 (0.07)
	1993	0.26 (0.17)	0.10 (0.05)
	1994	0.07 (0.04)	0.10 (0.05)

* Mean nest densities significantly different for that year at $P < 0.05$, Student's t-test.

Table 3. Mean nest density (SE) of species on grazed versus undisturbed sites on the South Fork of the Snake River. Mean nest density is the overall mean of average nest density for each site. Sample size is the number of sites for the overall mean nest density. In 1992, n=6 grazed and 8 undisturbed sites; in 1993, n=5 grazed and 11 undisturbed sites.

SPECIES		GRAZED	UNDISTURBED
Yellow Warbler	1992	2.65 (1.12)	4.46 (1.29)
	1993*	1.58 (0.44)	4.31 (0.94)
American Robin	1992	2.15 (0.98)	1.36 (0.50)
	1993*	4.57 (1.35)	2.15 (0.44)
Song Sparrow	1992	0.12 (0.79)	1.32 (0.85)
	1993	0.76 (0.72)	1.56 (1.13)
Mourning Dove	1992	0.45 (0.22)	0.25 (0.10)
	1993	0.13 (0.09)	0.44 (0.25)
House Wren	1992	0.96 (0.46)	0.14 (0.05)
	1993	0.72 (0.35)	0.23 (0.11)
Cedar Waxwing	1992*	0.06 (0.04)	0.55 (0.22)
	1993	0.21 (0.18)	0.19 (0.08)
Northern Oriole	1992	0.28 (0.19)	0.20 (0.09)
	1993	0.22 (0.22)	0.26 (0.13)
Warbling Vireo	1992	0.20 (0.15)	0.15 (0.08)
	1993	0.81 (0.71)	0.29 (0.14)
Black-headed Grosbeak	1992	0.01 (0.01)	0.31 (0.17)
	1993*	0.05 (0.05)	0.40 (0.14)
Veery	1992	0.02 (0.02)	0.28 (0.17)
	1993	0.01 (0.01)	0.21 (0.13)
Western Wood Peewee	1992	0.05 (0.04)	0.03 (0.02)
	1993	0.21 (0.13)	0.11 (0.06)
Northern Flicker	1992	0.13 (0.08)	0.04 (0.03)
	1993	0.26 (0.17)	0.10 (0.05)

* Mean nest densities significantly different for that year at $P < 0.05$, Student's t-test.

* Need 1994

Table 4. Mayfield daily survival rates and nesting success (%) for 1992 in large versus small plots for species with $\geq$ 15 nests.[1]

	LARGE			SMALL		
Species	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.952 (0.005)	(131)	29	0.931 (0.008)	(102)	16
AMRO	0.955 (0.006)	(86)	24	0.968 (0.005)	(68)	36
SOSP*	0.956 (0.015)	(15)	30	0.891 (0.026)	(21)	4
MODO	0.958 (0.012)	(17)	29	0.956 (0.015)	(13)	27
HOWR	0.986 (0.009)	(12)	62	0.993 (0.005)	(16)	79
CEWA	0.961 (0.012)	(17)	28	0.986 (0.010)	(8)	64
NOOR	0.991 (0.009)	(6)	76	0.985 (0.010)	(9)	63
WAVI	0.976 (0.014)	(7)	45	0.952 (0.023)	(8)	21

Table 5. Mayfield daily survival rates and nesting success (%) for 1993 in large versus small plots for species with $\geq$ 15 nests.[1]

	LARGE			SMALL		
Species	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA	0.957 (0.004)	(161)	33	0.945 (0.006)	(138)	25
AMRO	0.931 (0.007)	(109)	11	0.938 (0.006)	(131)	13
SOSP	0.910 (0.035)	(8)	8	0.955 (0.009)	(38)	29
HOWR	0.994 (0.003)	(19)	82	0.996 (0.002)	(20)	87
MODO	0.928 (0.017)	(20)	11	0.961 (0.013)	(17)	32
WAVI	0.955 (0.031)	(3)	30	0.950 (0.015)	(18)	20
BHGR	0.957 (0.019)	(8)	31	0.943 (0.020)	(11)	20
NOOR	0.954 (0.022)	(7)	23	0.974 (0.012)	(11)	44
WWPE	0.990 (0.007)	(11)	72	0.959 (0.020)	(7)	26

[1] There was no overall difference in survival rates between large and small plots when all species were combined for either 1992 or 1993 (critical value=0.006 using Bonferonni adjustment).

* Significant difference between plot sizes for single-species comparison ($P < 0.05$).

Table 6. Mayfield daily survival rates and nesting success (%) for 1994 in large versus small plots for species with $\geq$ 15 nests.[1]

	Large				Small			
Species	Survival	(SE)	(n)	% Success	Survival	(SE)	(n)	% Success
YEWA	0.918	0.008	119	12	0.921	0.008	128	13
AMRO	0.925	0.012	45	9	0.936	0.010	50	13
SOSP	0.883	0.025	20	3	0.932	0.012	44	15
MODO	0.894	0.023	20	4	0.909	0.025	14	6
CEWA*	0.978	0.012	7	50	0.901	0.028	14	3
WAVI	0.852	0.068	4	1	0.911	0.027	12	5
NOOR	0.983	0.011	6	60	0.988	0.008	9	69

[1] There was no overall difference in survival rates between small and large sites when all species were combined (critical value=0.007 using Bonferonni adjustment).

* Significant difference between plot sizes for single-species comparison ($P < 0.05$).

Table 7. Mayfield daily survival rates and nesting success (%) for 1992, 1993, & 1994 in large versus small plots for species with $\geq$ 20 nests.[1]

Species	LARGE			SMALL		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.946 (0.003)	(411)	25	0.934 (0.004)	(368)	18
AMRO	0.940 (0.004)	(240)	15	0.948 (0.004)	(249)	19
SOSP	0.920 (0.013)	(43)	10	0.937 (0.007)	(103)	17
MODO	0.931 (0.010)	(57)	13	0.947 (0.010)	(44)	20
HOWR	0.993 (0.003)	(37)	77	0.995 (0.002)	(44)	83
CEWA	0.961 (0.009)	(28)	28	0.942 (0.013)	(29)	15
NOOR	0.978 (0.008)	(19)	51	0.982 (0.006)	(29)	57
WAVI	0.954 (0.015)	(14)	22	0.940 (0.011)	(38)	14
BHGR	0.963 (0.013)	(14)	37	0.959 (0.010)	(25)	33
VEER*	0.965 (0.015)	(12)	41	0.869 (0.035)	(16)	3
WWPE	0.984 (0.007)	(19)	61	0.964 (0.012)	(14)	31
RNSA	1.000 (0.000)	(10)	100	0.993 (0.005)	(12)	74
AMGO	0.968 (0.013)	(14)	37	0.970 (0.017)	(8)	41
NOFL*	1.000 (0.000)	(8)	100	0.978 (0.009)	(13)	37

[1] There was no overall difference in survival rates between large and small plots when all species were combined (critical value=0.003 using Bonferonni adjustment).

* Significant difference between plot sizes for single-species comparison ($P < 0.05$).

Table 8. Mayfield daily survival rates and nesting success (%) for 1992, 1993, & 1994 in large versus small undisturbed plots for species with $\geq$ 20 nests.[1]

Species	LARGE			SMALL		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA	0.937 (0.004)	(304)	20	0.935 (0.004)	(331)	19
AMRO	0.941 (0.006)	(139)	15	0.940 (0.006)	(140)	15
SOSP	0.901 (0.018)	(32)	6	0.940 (0.007)	(98)	19
MODO	0.930 (0.011)	(44)	12	0.946 (0.011)	(35)	20
HOWR	0.988 (0.006)	(18)	66	0.990 (0.005)	(20)	70
CEWA	0.969 (0.010)	(18)	36	0.945 (0.013)	(28)	16
NOOR	----- -------	(0)	--	0.978 (0.011)	(11)	50
WAVI	0.909 (0.035)	(7)	5	0.922 (0.016)	(30)	7
BHGR	0.959 (0.018)	(8)	33	0.959 (0.010)	(25)	33
VEER*	0.955 (0.022)	(9)	32	0.869 (0.035)	(16)	3
WWPE	0.989 (0.007)	(9)	71	0.963 (0.015)	(10)	30
RNSA	1.000 (0.000)	(7)	100	0.992 (0.006)	(9)	69
AMGO	0.968 (0.014)	(12)	38	0.970 (0.017)	(8)	41
NOFL*	1.000 (0.000)	(5)	100	0.979 (0.010)	(9)	38

[1] There was no overall difference in survival rates between large and small ungrazed plots when all species were combined (critical value=0.003 using Bonferonni adjustment).

* Significant difference between plot sizes for single-species comparison ($P < 0.05$).

Table 9. Mayfield daily survival rates and nesting success (%) for 1992, 1993, & 1994 in large versus small grazed plots for species with $\geq$ 20 nests.[1]

Species	LARGE			SMALL		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.965 (0.004)	(107)	41	0.921 (0.014)	(37)	13
AMRO	0.939 (0.007)	(101)	14	0.955 (0.005)	(109)	24
SOSP	0.957 (0.017)	(11)	31	0.861 (0.058)	(5)	2
MODO	0.937 (0.020)	(13)	15	0.949 (0.022)	(9)	22
HOWR	0.996 (0.003)	(19)	86	0.999 (0.002)	(24)	94
CEWA	0.935 (0.026)	(10)	11	0.778 (0.196)	(1)	0
NOOR	----- -------	(0)	--	0.978 (0.011)	(11)	50
WAVI	0.977 (0.013)	(7)	47	0.978 (0.012)	(8)	49
BHGR	0.969 (0.018)	(6)	43	----- -------	(0)	--
VEER	0.981 (0.018)	(3)	63	----- -------	(0)	--
WWPE	0.978 (0.012)	(10)	49	0.965 (0.024)	(4)	32
RNSA	1.000 (0.000)	(3)	100	1.000 (0.000)	(3)	100
AMGO	0.968 (0.032)	(2)	37	----- -------	(0)	--
NOFL	1.000 (0.000)	(3)	100	0.976 (0.024)	(4)	32

[1] There was no overall difference in survival rates between large and small grazed plots when all species were combined (critical value=0.005 using Bonferonni adjustment).

* Significant difference between plot sizes for single-species comparison ($P < 0.05$).

Table 10. Mayfield daily survival rates and nesting success (%) for 1992 in grazed versus undisturbed plots for species with $\geq$ 15 nests.[1]

	GRAZED			UNDISTURBED		
Species	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA	0.947 (0.007)	(74)	25	0.942 (0.006)	(159)	23
AMRO	0.960 (0.005)	(90)	28	0.962 (0.006)	(64)	30
SOSP*	0.967 (0.016)	(9)	40	0.905 (0.020)	(27)	7
MODO	0.960 (0.016)	(12)	30	0.956 (0.014)	(18)	27
HOWR*	1.000 (0.000)	(18)	100	0.972 (0.012)	(10)	37
CEWA	0.951 (0.024)	(7)	20	0.975 (0.009)	(18)	45
NOOR	0.988 (0.012)	(6)	70	0.988 (0.009)	(9)	68
WAVI	0.979 (0.012)	(8)	52	0.931 (0.033)	(7)	10

Table 11. Mayfield daily survival rates and nesting success (%) for 1993 in grazed versus undisturbed plots for species with $\geq$ 15 nests.[1]

	GRAZED			UNDISTURBED		
Species	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.967 (0.006)	(70)	43	0.946 (0.004)	(229)	25
AMRO	0.937 (0.007)	(120)	13	0.933 (0.007)	(120)	12
SOSP	0.875 (0.044)	(7)	3	0.958 (0.009)	(39)	32
HOWR	0.996 (0.002)	(25)	87	0.993 (0.005)	(14)	78
MODO	0.913 (0.030)	(10)	7	0.952 (0.011)	(27)	24
WAVI	0.974 (0.015)	(7)	43	0.933 (0.020)	(14)	11
BHGR	0.957 (0.024)	(5)	31	0.946 (0.017)	(14)	23
NOOR	0.968 (0.018)	(5)	36	0.968 (0.012)	(13)	36
WWPE	0.971 (0.014)	(11)	39	0.987 (0.009)	(7)	66

[1] There was no overall difference in survival rates between grazed and undisturbed plots when all species were combined for either 1992 or 1993 (critical value=0.006 using Bonferonni adjustment).

* Significant difference between treatments for single-species comparison ($P < 0.05$).

Table 12. Mayfield daily survival rates and nesting success (%) for 1992 and 1993 in grazed versus undisturbed plots for species with $\geq$ 20 nests.[1]

Species	GRAZED			UNDISTURBED		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.957 (0.005)	(144)	33	0.945 (0.003)	(388)	24
AMRO	0.949 (0.004)	(210)	19	0.945 (0.005)	(184)	17
SOSP	0.938 (0.018)	(16)	18	0.943 (0.009)	(66)	20
MODO	0.942 (0.015)	(22)	18	0.954 (0.008)	(45)	25
HOWR	0.997 (0.002)	(43)	90	0.986 (0.006)	(24)	61
CEWA	0.928 (0.026)	(11)	9	0.966 (0.009)	(25)	33
NOOR	0.978 (0.011)	(11)	50	0.977 (0.008)	(22)	49
WAVI*	0.977 (0.009)	(15)	48	0.933 (0.017)	(21)	11
BHGR	0.969 (0.018)	(6)	43	0.962 (0.010)	(24)	35
VEER*	0.982 (0.018)	(3)	63	0.920 (0.024)	(18)	12
WWPE	0.974 (0.011)	(14)	43	0.990 (0.007)	(9)	73
EUST	0.993 (0.005)	(22)	78	1.000 (0.000)	(2)	100

[1] There was no overall difference in survival rates between grazed and undisturbed plots when all species were combined (critical value=0.004 using Bonferonni adjustment).

* Significant difference between treatments for single-species comparison ($P < 0.05$).

Table 13. Mayfield daily survival rates and nesting success (%) for 1992 and 1993 in upstream, grazed versus undisturbed plots for species with $\geq$ 20 nests.[1]

Species	GRAZED			UNDISTURBED		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.970 (0.007)	(38)	47	0.928 (0.005)	(239)	15
AMRO	0.940 (0.006)	(113)	15	0.936 (0.007)	(101)	13
SOSP	0.937 (0.018)	(16)	17	0.944 (0.009)	(58)	21
MODO	0.972 (0.020)	(5)	44	0.941 (0.020)	(10)	17
HOWR	0.996 (0.004)	(11)	86	0.967 (0.016)	(8)	31
CEWA*	0.755 (0.087)	(7)	0	0.956 (0.015)	(14)	23
NOOR	----- -------	(0)	--	0.988 (0.008)	(11)	68
WAVI*	0.976 (0.010)	(12)	46	0.933 (0.017)	(21)	11
BHGR	0.969 (0.018)	(6)	43	0.940 (0.019)	(12)	19
VEER*	0.981 (0.018)	(3)	63	0.896 (0.040)	(10)	6
WWPE	----- -------	(0)	--	1.000 (0.000)	(2)	100
EUST	0.987 (0.009)	(11)	62	----- -------	(0)	--

[1] There was no overall difference in survival rates between upstream, grazed and undisturbed plots when all species were combined (critical value=0.005 using Bonferonni adjustment).

* Significant difference between treatments upstream for single-species comparison ($P < 0.05$).

Table 14. Mayfield daily survival rates and nesting success (%) for 1992 and 1993 in downstream, grazed versus undisturbed plots for species with $\geq$ 20 nests.[1]

Species	GRAZED			UNDISTURBED		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA	0.951 (0.006)	(106)	28	0.964 (0.004)	(149)	40
AMRO	0.957 (0.005)	(97)	25	0.956 (0.006)	(83)	24
SOSP	----- -------	(0)	--	0.932 (0.029)	(8)	15
MODO	0.929 (0.020)	(17)	12	0.957 (0.009)	(35)	28
HOWR	0.997 (0.002)	(32)	92	0.993 (0.004)	(16)	79
CEWA	0.986 (0.014)	(4)	64	0.974 (0.011)	(11)	44
NOOR	0.978 (0.011)	(11)	50	0.968 (0.013)	(11)	36
WAVI	0.982 (0.018)	(3)	55	----- -------	(0)	--
BHGR	----- -------	(0)	--	0.978 (0.010)	(12)	53
VEER	----- -------	(0)	--	0.940 (0.029)	(8)	21
WWPE	0.974 (0.011)	(14)	43	0.987 (0.009)	(7)	65
EUST	1.000 (0.000)	(11)	100	1.000 (0.000)	(2)	100

[1] There was no overall difference in survival rates between downstream, grazed and undisturbed plots when all species were combined (critical value=0.006 with EUST, and 0.007 without EUST, using Bonferonni adjustment).

Table 15. Mayfield daily survival rates and nesting success (%) for 1994 in undisturbed plots for species with $\geq$ 15 nests.[1]

	Ungrazed			
Species	Survival	(SE)	(n)	% Success
YEWA	0.920	0.006	247	12
AMRO	0.931	0.008	95	11
SOSP	0.919	0.011	64	10
MODO	0.901	0.017	34	5
CEWA	0.944	0.014	21	16
WAVI	0.900	0.025	16	3
NOOR	0.986	0.007	15	65

[1] No grazed plots were searched in 1994.

Table 16. Mayfield daily survival and percent nesting success for 1992 in upstream versus downstream plots for species with $\geq$ 15 nests.[1]

	UPSTREAM			DOWNSTREAM		
Species	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.934 (0.007)	(119)	18	0.952 (0.006)	(114)	29
AMRO*	0.952 (0.006)	(87)	22	0.971 (0.006)	(67)	41
SOSP*	0.918 (0.016)	(32)	10	0.980 (0.020)	(4)	58
MODO	0.961 (0.014)	(11)	32	0.954 (0.013)	(19)	26
HOWR	0.987 (0.009)	(9)	32	0.993 (0.005)	(19)	79
CEWA*	0.947 (0.017)	(14)	18	0.987 (0.007)	(11)	66
NOOR	0.990 (0.010)	(6)	74	0.986 (0.009)	(9)	66
WAVI	0.966 (0.014)	(13)	33	0.968 (0.032)	(2)	35

Table 17. Mayfield daily survival rates and nesting success (%) for 1993 in upstream versus downstream plots for species with $\geq$ 15 nests.[1]

	UPSTREAM			DOWNSTREAM		
Species	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.939 (0.006)	(158)	21	0.964 (0.004)	(140)	40
AMRO	0.927 (0.007)	(127)	9	0.944 (0.006)	(113)	17
SOSP	0.955 (0.009)	(42)	29	0.830 (0.078)	(4)	1
HOWR	0.985 (0.009)	(10)	59	0.998 (0.002)	(29)	92
MODO	0.878 (0.066)	(4)	2	0.948 (0.011)	(33)	21
WAVI	0.946 (0.014)	(20)	17	----- (----)	(1)	--
BHGR*	0.921 (0.023)	(13)	11	0.983 (0.012)	(6)	63
NOOR	0.984 (0.016)	(5)	60	0.963 (0.013)	(13)	31
WWPE	----- (----)	(1)	--	0.977 (0.009)	(17)	48

[1] There was no overall difference in survival rates between upstream and downstream plots when all species were combined for either 1992 or 1993 (critical value=0.006 using Bonferonni adjustment).

* Significant difference between plot locations for single-species comparison ($P < 0.05$).

Table 18. Mayfield daily survival rates and nesting success (%) for 1994 in upstream versus downstream plots for species with $\geq$ 15 nests.[1]

	Upstream				Downstream			
Species	Survival	(SE)	(n)	% Success	Survival	(SE)	(n)	% Success
YEWA*	0.882	0.011	122	4	0.942	0.006	125	23
AMRO*	0.888	0.019	36	2	0.947	0.008	59	18
SOSP	0.921	0.012	48	11	0.911	0.024	16	8
MODO	0.920	0.077	2	9	0.899	0.018	32	5
CEWA*	0.899	0.032	11	3	0.969	0.013	10	37
WAVI	0.906	0.026	14	4	0.833	0.107	2	0
NOOR	0.982	0.010	9	56	0.992	0.008	6	78

[1] There was no overall difference in survival rates between upstream and downstream plots when all species were combined (critical value=0.007 using Bonferonni adjustment).

* Significant difference between plot locations for single-species comparison ($P < 0.05$).

Table 19. Mayfield daily survival rates and nesting success (%) for 1992, 1993, & 1994 in upstream versus downstream plots for species with $\geq$ 20 nests.[1]

Species	UPSTREAM			DOWNSTREAM		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.925 (0.004)	(399)	14	0.954 (0.003)	(380)	31
AMRO*	0.933 (0.005)	(250)	12	0.954 (0.004)	(239)	23
SOSP	0.935 (0.007)	(122)	16	0.918 (0.019)	(24)	10
MODO	0.950 (0.015)	(17)	22	0.935 (0.008)	(84)	14
HOWR	0.983 (0.007)	(20)	55	0.996 (0.001)	(61)	88
CEWA*	0.922 (0.016)	(32)	7	0.974 (0.008)	(25)	44
NOOR	0.985 (0.007)	(20)	62	0.978 (0.007)	(28)	50
WAVI	0.943 (0.010)	(47)	15	0.955 (0.025)	(5)	23
BHGR	0.955 (0.011)	(25)	29	0.970 (0.011)	(14)	44
VEER	0.930 (0.020)	(18)	16	0.922 (0.030)	(10)	13
WWPE	0.972 (0.014)	(8)	40	0.978 (0.007)	(25)	48
RNSA	0.995 (0.003)	(17)	80	1.000 (0.000)	(5)	100
AMGO	0.974 (0.015)	(8)	45	0.966 (0.014)	(14)	35
NOFL*	0.987 (0.006)	(17)	56	1.000 (0.000)	(4)	100

[1] There was no overall difference in survival rates between upstream and downstream plots when all species were combined (critical value=0.004 using Bonferonni adjustment).

* Significant difference between plot locations for single-species comparison ($P < 0.05$).

Table 20. Mayfield daily survival rates and nesting success (%) for 1992, 1993, & 1994 grazed, upstream versus downstream plots for species with $\geq$ 20 nests.[1]

Species	UPSTREAM			DOWNSTREAM		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.970 (0.007)	(38)	47	0.951 (0.006)	(106)	28
AMRO*	0.940 (0.006)	(113)	15	0.957 (0.005)	(97)	25
SOSP	0.937 (0.018)	(16)	17	----- -------	(0)	--
MODO	0.972 (0.020)	(5)	44	0.929 (0.020)	(17)	12
HOWR	0.996 (0.004)	(11)	86	0.997 (0.002)	(32)	92
CEWA*	0.755 (0.087)	(7)	0	0.986 (0.014)	(4)	64
NOOR	----- -------	(0)	--	0.978 (0.011)	(11)	50
WAVI	0.976 (0.010)	(12)	46	0.982 (0.018)	(3)	55
BHGR	0.969 (0.018)	(6)	43	----- -------	(0)	--
VEER	0.981 (0.018)	(3)	63	----- -------	(0)	--
WWPE	----- -------	(0)	--	0.974 (0.011)	(14)	43
RNSA	1.000 (0.000)	(4)	100	1.000 (0.000)	(2)	100
AMGO	----- -------	(0)	--	0.968 (0.032)	(2)	37
NOFL	0.989 (0.011)	(5)	61	1.000 (0.000)	(2)	100

[1] There was no overall difference in survival rates between grazed, upstream and downstream plots when all species were combined (critical value=0.006 using Bonferonni adjustment).

* Significant difference between grazed plots and their location for single-species comparison ($P < 0.05$).

Table 21. Mayfield daily survival rates and nesting success (%) for 1992, 1993, & 1994 undisturbed, upstream versus downstream plots for species with $\geq$ 20 nests.[1]

Species	UPSTREAM			DOWNSTREAM		
	Survival (SE)	(n)	% Success	Survival (SE)	(n)	% Success
YEWA*	0.916 (0.004)	(361)	11	0.955 (0.003)	(274)	32
AMRO*	0.927 (0.007)	(137)	10	0.952 (0.005)	(142)	22
SOSP	0.934 (0.007)	(106)	16	0.918 (0.019)	(24)	10
MODO	0.939 (0.020)	(12)	16	0.937 (0.008)	(67)	15
HOWR	0.959 (0.018)	(9)	23	0.995 (0.003)	(29)	84
CEWA*	0.937 (0.015)	(25)	12	0.972 (0.009)	(21)	40
NOOR	0.985 (0.007)	(20)	62	0.978 (0.008)	(17)	50
WAVI	0.923 (0.014)	(35)	7	0.833 (0.107)	(2)	0
BHGR	0.950 (0.013)	(19)	25	0.970 (0.011)	(14)	44
VEER	0.904 (0.029)	(15)	8	0.922 (0.030)	(10)	13
WWPE	0.972 (0.014)	(8)	40	0.981 (0.009)	(11)	54
RNSA	0.994 (0.004)	(13)	78	1.000 (0.000)	(3)	100
AMGO	0.974 (0.015)	(8)	45	0.965 (0.015)	(12)	34
NOFL	0.987 (0.006)	(12)	54	1.000 (0.000)	(2)	100

[1] There was no overall difference in survival rates between undisturbed, upstream and downstream plots when all species combined (critical value=0.003 using Bonferonni adjustment).

* Significant difference between plot locations for single-species comparison ($P < 0.05$).

Appendix A. Avian species list for which nests were located along the South Fork of the Snake River, ID in 1992, 1993, and 1994.

Abbreviation	Species	Scientific Name
YEWA	Yellow Warbler	*Dendroica petechia*
AMRO	American Robin	*Turdus migratorius*
SOSP	Song Sparrow	*Melospiza melodia*
MODO	Mourning Dove	*Zenaida macroura*
HOWR	House Wren	*Troglodytes aedon*
CEWA	Cedar Waxwing	*Bombycilla cedorum*
NOOR	Northern Oriole	*Icterus glabula*
WAVI	Warbling Vireo	*Vireo gilvus*
BHGR	Black-headed Grosbeak	*Pheucticus melanocephalus*
VEER	Veery	*Catharus fuscenscens*
DUFL	Dusky Flycatcher	*Empidonax oberholseri*
EUST	European Starling	*Sturnus vulgaris*
GRCA	Gray Catbird	*Dumetella carolinensis*
CHSP	Chipping Sparrow	*Spizella passerina*
NOFL	Northern Flicker	*Colaptes auratus*
RNSA	Red-naped Sapsucker	*Sphyrapicus nuchalis*
TRSW	Tree Swallow	*Tachycineta bicolor*
WWPE	Western Wood-pewee	*Contopus sordidulus*
YRWA	Yellow-rumped Warbler	*Dendroica coronata*
BCCH	Black-capped Chickadee	*Parus atricaphillus*
MOCH	Mountain Chickadee	*Parus gambeli*
DOWO	Downy Woodpecker	*Picoides pubescens*
LZBU	Lazuli Bunting	*Passerina amoena*
FOSP	Fox Sparrow	*Passerella iliaca*
YBCH	Yellow-breasted Chat	*Icteria virens*
AMGO	American Goldfinch	*Carduelis tristis*
RWBB	Red-winged Blackbird	*Agelaius phoeniceus*
BCHU	Black-chinned Hummingbird	*Archilochus alexandri*
WETA	Western Tanager	*Piranga ludoviciana*
YBCU	Yellow-billed Cuckoo	*Coccyzus americanus*
AMCR	American Crow	*Corvus brachyrhynchos*
BBMA	Black-billed Magpie	*Pica pica*
BTHU	Broad-tailed Hummingbird	*Selasphorus platycercus*
BWTE	Blue-winged Teal	*Anas discors*
MALL	Mallard	*Anas platyrhynchos*
COHA	Cooper's Hawk	*Accipiter cooperii*
SSHA	Sharp-shinned Hawk	*Accipiter striatus*
AMKE	American Kestrel	*Falco sparverius*
RUGR	Ruffed Grouse	*Bonasa umbellus*
LEOW	Long-eared Owl	*Asio otus*

Appendix A. cont.

SPSA	Spotted Sandpiper	*Actitis macularia*
HAWO	Hairy Woodpecker	*Picoides villosus*
MGWA	Magillvray's Warbler	*Oporornis tolmiei*
VGSW	Violet-green Swallow	*Tachycineta thalassina*
CAFI	Cassin's Finch	*Carpodacus cassinii*
WBNU	White-breasted Nuthatch	*Sitta carolinensis*
RBNU	Red-breasted Nuthatch	*Sitta canadensis*
SOVI	Solitary Vireo	*Vireo solitarius*

Appendix B. Plant species list of avian nesting substrates used along the South Fork of the Snake River,ID in 1992.

Abbreviation	Species	Scientific Name
Ace neg	Boxelder	*Acer negundo*
Aln inc	Thin-leaved Alder	*Alnus incana*
Ame aln	Serviceberry	*Amelanchier alnifolia*
Bet occ	Water Birch	*Betula occidentalis*
Cle lig	Western Clematis	*Clematis ligusticifolia*
Cor sto	Dogwood	*Cornus stolonifera*
Cra dou	Black Hawthorne	*Crataegus douglasii*
Cra col	Columbia Hawthorne	*Crataegus columbiana*
Ela com	Silverberry	*Elaeagnus commutata*
Jun sco	Rocky Mountain Juniper	*Juniperus scopulorum*
Lon inv	Black Twinberry	*Lonicera involucrata*
Phy mal	Ninebark	*Physocarpus malvaceus*
Pop ang	Narrow-leaved Cottonwood	*Populus angustifolia*
Pop nig	Black Cottonwood	*Populus nigra*
Pop tre	Quaking Aspen	*Populus tremuloides*
Pru vir	Chokecherry	*Prunus virginiana*
Pse men	Douglas-fir	*Pseudotsuga menziesii*
Pyr mal	Apple	*Pyrus malus*
Rhu tri	Sumac	*Rhus trilobata*
Rib aur	Golden Currant	*Ribes aureum*
Rib set	Missouri Gooseberry	*Ribes setosum*
Ros woo	Woods Rose	*Rosa woodsii*
Sal spp.	Willows	*Salix spp.*